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# TROPICAL TESTING ESTABLISHMENT

NIGERIA

## QUARTERLY PROGRESS REPORT

JANUARY - MARCH 1955

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DIRECTORATE OF MATERIALS AND EXPLOSIVES RESEARCH AND DEVELOPMENT

TROPICAL TESTING ESTABLISHMENT

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QUARTERLY PROGRESS REPORT

January - March, 1955.

U.D.C. No. 620.19(213)

Approved by

B.J. MacNulty,  
Superintendent, T.T.E.

All enquiries relating to this report or to the  
Tropical Testing Establishment and the use of its  
facilities, should be sent to :-

T.T.E. LIAISON OFFICER,  
ROOM S.477, SHELL MEX HOUSE,  
STRAND, LONDON, W.C. 2.

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QUARTERLY PROGRESS REPORT

JANUARY - MARCH, 1955.

INTRODUCTION.

The work of the station has continued smoothly during the quarter. The administrative side has been short handed during most of the period owing to the absence of several officers on leave in U.K. but these have now returned and the work is up to date.

Scientific staff has been below full strength; one on leave, the replacement for Mr. Risley, electronics section, still unfilled after five months (this vacancy is causing us concern since the work in connection with trials of plastics is increasing) and the never-filled S.S.O. post in chemistry.

Work in the electronic and photographic sections was held up for two or three days owing to a large section of the roof being torn off in a severe storm. No serious damage was done to the laboratories and the roof has been repaired.

The Colonial Secretary, the Right Honourable A.T. Lennox Boyd visited Nigeria during the period. Whilst in Port Harcourt he showed great interest in the work of the establishment and made special arrangements to be shown over our premises.

D.M.X.R.D. Dr. C.H. Johnson, and Mr. R.A. Thomson, Assistant Secretary M.S.6. visited the establishment early in the year. In a fortnight they inspected all the exposure sites with the exception of Lighthouse Beach which had to be omitted from the itinerary owing to late arrival of their aircraft from U.K. Consultations were held with all the staff; the future work of the establishment and the plans for erecting modern laboratories in PORT HARCOURT were discussed.

The number of samples handled has remained high, the bulk of them being plastics. Details are given in Section 1. The number of reports outstanding has been considerably reduced and it is hoped to be completely up to date by the end of the next quarter.

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QUARTERLY PROGRESS REPORT

JANUARY - MARCH, 1955

1. GENERAL

1.1 The number of samples handled during the quarter continues to be high as shown in para 1.2. Metal adhesives (para. 7.3) and the remainder of the Polystyrene (para. 5.3) accounts for most of the samples put on exposure, whilst the exceptionally high number taken off are mainly the first withdrawals of Polystyrene and the second withdrawals of Nylon Mouldings (para. 5.8).

1.2 The table below gives the number of samples dealt with during the quarter :-

	<u>Current Quarter</u>	<u>Last Quarter</u>
On exposure at beginning of quarter	9,164	6,975
Put on during quarter	953	3,372
Taken off during quarter	1,515	1,183
On exposure at end of quarter	8,602	9,164
Awaiting exposure at end of quarter	92	818

1.3 The following non classified reports have been issued during the quarter.

382	Felt - Resistance to Fungal and Bacterial attack.	-
390	Nylon Mouldings.	- 1st Interim Report.
391	Plywood Adhesives.	- Final Report.
392	Bridge Decking Materials.	- 4th Interim Report.
393	Rot-Proofing with Mineral Oxides.	- 2nd Interim Report.
394	Adhesives for Metals.	- 2nd Interim Report.

1.4 In the following sections of this report, those items which are mentioned for the first time are marked with an asterisk

2. METAL CORROSION.

2.1 Painted Steel Plates. (TTE/MOS.19/V.3). The report based on the inspection after six years exposure, has been prepared and is ready for issue. No further inspections were due during the quarter.

2.2 Metal Coated Steel Plates. (TTE/RA.19/V.2). The report referred to in the last progress report is now ready for issue. No action was due during the present quarter.

\* 2.3 Aluminium Alloys. (TTE/MOS.19/V.10). Arrangements are in hand for an extensive trial on a wide range of aluminium alloys on behalf of Aluminium Laboratories Ltd. Over 300 samples are involved most of which are to be exposed at the Marine Site, LAGOS. The samples are expected early in the new quarter.

2.4 Metal Finishes. (TTE/MOS.19/V.7). The sixty samples of zinc alloys have been re-exposed for seven months; there is little change in their condition during the quarter.

2.5 Assessment of Atmospheric Corrosiveness.

.51 Atmospheric Pollution Test. (TTE/MOS.19/V.5). The new series of samples for assessing the atmospheric pollution have now been on exposure about three months. The behaviour is similar to that shown by previous series.

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.52 Atmospheric Salinity. No further work has been done during the quarter.

.53 Industrial Pollution. There is still little corrosion on either the zinc or aluminium samples exposed adjacent to a wood fire at the jungle site. The trial will be terminated and the rate of corrosion will be assessed during the next quarter, i.e. after ten to twelve months' exposure.

.54 Nodular Cast Iron. (TTE/MOS.19/V.9). The samples have been on exposure for two years at the Marine Site, LAGOS. All the samples are heavily rusted, but there has been little change in condition during the quarter and no dramatic difference between the individual samples. A report covering 18 months' exposure has been prepared.

2.6 General Trials on Metal Corrosion. A further withdrawal of steel and aluminium has been made at LAGOS, after 9 months' exposure. The results on the aluminium confirm those found at PORT HARCOURT in that the corrosion appears to reverse after about 9 months. The steel results have shown a slight increase due probably to the splitting off of steel with the surface layer of rust. Samples from the International Nickel Co. are still on exposure at PORT HARCOURT and LAGOS. One pair has been returned to America for assessment by their standard method.

There has also been a withdrawal of the samples which were exposed at SORRENTO in Australia. The results on the steel and brass conform very closely to those obtained from previous exposures at this site, the corrosion being considerably less than that at LAGOS but slightly greater than that experienced at Jungle Site. It is interesting to note that similar samples at DUNGENESS in U.K. show a greater rate of corrosion than that at SORRENTO. The results on aluminium and zinc are the first we have obtained from SORRENTO and they do show corrosion rates comparable with those at LAGOS.

The ceramic coated magnesium panel received from the Pitman Dunn Laboratories in U.S.A. which has been on exposure at Lighthouse Beach for about three years is now showing a surface scaling of an hexagonal pattern. The surface is still greenish except where the minute scales have flaked off. In some areas there is deep pitting with flecks of white corrosion. All these imperfections are minute, but are readily visible under a x10 hand lens.

2.7 Metals in Association with wood. These samples have now been exposed for 18 months. There is little change in their condition during the last quarter, and there is still little apparent difference between the 13 timbers in their effect on the corrosion of adjacent mild steel. It is proposed to leave the samples for two years before making an assessment of the corrosion.

2.8 Underwater Corrosion. No further withdrawals have been made in this trial. Arrangements are in hand to start a new series of trials both at PORT HARCOURT and at LAGOS. The periodic sampling and examination of the waters at LAGOS and elsewhere, in connection with underwater corrosion, continues.

3. TIMBER.

3.2 Plywood Adhesives. (TTE/RA.9/K.5). This trial was concluded in November 1954 after a total of five years' exposure for samples under cover, the samples on open exposure having been withdrawn after four years. Those stacked under cover showed considerable warping but only slight delamination, the latter being more noticeable on beech than on gaboon and on samples with melamine and urea formaldehyde adhesives rather than those based on phenol formaldehyde and resorcinol formaldehyde.

The relative merits of the ten adhesives are best judged from the samples on open exposure as under those conditions deterioration was much more advanced. Delamination was particularly severe in the samples bonded with urea, fortified urea and melamine resins. Panels bonded with film phenolic, liquid phenol and resorcinol resins showed little or no delamination. Beech panels deteriorated somewhat earlier and to a greater extent than gaboon panels.

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3.3 Plywood Glue Line Protection. (TTE/MOS.9/K.8). All samples have now been withdrawn from the three sites and the trial terminated. Representative samples are being returned to the sponsors. The final report is nearing completion.

3.4 Durability of Assembly Glues. (TTE/MOS.9/K.10). The samples bonded with casein glue have shown five B type failures (i.e. specimens in which the grain of the wood pieces lie parallel) among those exposed in the open sided hut at PORT HARCOURT. There has been little change during the quarter in any of the other samples at any of the sites.

3.5 Termite resistant timbers. The experiment to investigate the effect of camwood dye on termites is still in progress. Results to date suggest that camwood (*Pterocarpus soyauxii*) has a high degree of resistance to termite attack even when the red dye has been extracted from it. The results so far obtained of the tests in which susceptible deal wood was impregnated with camwood dye have not been conclusive.

3.6 Aircraft Assembly Adhesives. (TTE/MOS.9/K.6). Further samples were withdrawn during the quarter, after four years' exposure. The samples show slight discolouration of the wood, owing to rain that had entered the box before the renovation referred to in the last Progress Report had been effected. Otherwise the samples showed little change. A report is in course of preparation.

3.7 Teredo resistant Timbers. Eighteen Nigerian timbers were exposed to teredo attack at PORT HARCOURT Harbour for three months. Two timbers, Nchana and Lagos Mahogany were fairly heavily attacked. Pour, Ushoe, Ubura, Oboche, and *Pterocarpus Soyauxii* were free of infestation. Parallel experiments are now being carried out at LAGOS, OPOBO and CALABAR.

*Ekki* (*Lophira alata*), which has been reported to be particularly resistant to shipworm damage, was almost completely destroyed by teredo during seven months immersion in Tarquah Bay, LAGOS. The same wood showed no teredo damage during three months' immersion at OPOBO.

4. PAINTS.

4.1 Fungus Resisting Paints.

.11 Jenson and Nicholson. (TTE/MOS.11/M.6). The trial has now been terminated and samples are being returned to the sponsors. The final report is nearing completion.

.12 Nuodex. (TTE/MOS.11/M.9). There has been little change in the samples during the quarter. The five panels with varnish finish have shown the most marked deterioration, owing to rusting. There is now slight blistering on most of the panels in the Jungle Clearing but not on those in Jungle Undergrowth. Superficial algal and associated mould growths are present on all panels but this has not affected the paints; the growths can be easily removed with a damp cloth.

4.2 Admiralty Paint Panels. (TTE/MOS.11/M.7). These 42 samples have now been on exposure at the Marine Site, LAGOS for one year and a report covering this period has been prepared, and will be issued shortly. All the panels show some rusting, chiefly at the edges. Of the two primers under test Cream Rustodian is associated with cracking along the brush marks; Red Lead Primer appears to afford slightly better protection to the steel. Most of the panels show some chalking and blistering and in this respect three of the top coats appear better than the other four. The differences between the seven top coats are probably only in details of formulation or technique of application as they are reputed to be all to the same specification.

4.3 Paints, War Equipment. (TTE/MOS.11/M.11). These panels have now been on exposure for four months, the only change occurring being slight chalking on the white painted panel.

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4.4 Service Paint Systems. (TTE/MOS.11/M.4). No further examinations of these samples have been made, but one is due early next quarter. As mentioned before, many of the panels are in a very advanced state of deterioration, and several have disintegrated. A report covering three years' exposure has been prepared. The steel samples are so rusted that little paint is left. Eight of the fourteen aluminium panels are still free from corrosion and this has suggested some differences in the protection afforded by the various finishes. Both the magnesium and the cadmium plated steel panels show heavy white corrosion. The main effects on the teak wood panel are checking of the paint film and the development of algal growths.

4.5 Oil Paints, Ready Mixed. (TTE/MOS.11/M.12). The samples exposed in the Jungle Clearing for four months have shown little obvious change with the exception of one panel which shows the first signs of cracking. After two months' exposure at the Desert Site the only changes visible were slight chalking on two of the panels and slight fading on all samples.

4.7 Miscellaneous Paints.

.71 Leighs Paints. This trial is in the process of being closed after two years' exposure and a final report is in course of preparation.

.72 Pammel Paints. This trial is being concluded after 18 months' exposure and a report is in course of preparation.

.73 Avarc Silica/Graphite Paints. A report on these samples after 12 months' immersion at LAGOS will soon be issued.

4.8 Anti-Fouling and Anti-Teredo Paints.

.81 Protective Treatments. The final withdrawal of the treated mahogany panels on exposure on the raft at LAGOS was made during the quarter. Examination showed that the addition of powdered glass to paint applied to wood did not confer any protection from teredo attack. Mahogany panels painted with a proprietary anti-fouling/anti-teredo paint containing copper salts were only very slightly attacked by teredo during the same period.

.82 Admiralty (C.M.L.) Trial. (TTE/MOS.14/Q.5). After three months' exposure the wood (anti-teredo) panels were withdrawn for more complete examination as the loss of panels suggested heavy teredo infestation. Eleven panels were missing and others had worked loose. There was no teredo attack of the withdrawn panels but remnants of the bare wood controls were severely infested. A repeat of this section of the trial is being arranged.

The fouling on the steel (anti-fouling) panels has been recorded throughout the period and the results to date are being analysed and will be reported in the near future.

5. PLASTICS.

5.1 Uncoloured "Perspex". The special additional report on this trial has not yet been issued.

5.2 "Perspex" of High Softening Point. (TTE/MOS.6/G.19). These samples have now been on exposure for about ten months. A report covering three months' exposure has been issued, and one covering six months of the trial is in course of preparation. The bubbles in the adhesive joints have increased in size and number on most of the samples on open exposure, though those stored boxed and under cover at the same sites showed little change.

5.3 Polystyrene Mouldings. (TTE/MOS.6/G.17). The first withdrawals (after three months) have been made from all sites but the Desert Site. Wherever the samples have been exposed to direct sunlight the colour or transparency of nearly all grades have been affected and the impact strength has fallen, in one case very drastically. No other major changes have taken place. A report on the first three months' exposure will be prepared during the next quarter.

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5.8 Moulded Nylon. (TTE/MOS.6/G.15). The report covering the first three months of this trial was issued early in the quarter. The six month withdrawal has now been made from all sites, and a report covering this period has been prepared. At all sites, all samples originally packed wet have continued to lose weight over the six months, and those packed dry which gained in weight over the first three months have lost half that gain during the second three months. There are still no definite trends in the changes in specific gravity of the various samples at the various sites.

5.9 Expanded P.V.C. This sample has been withdrawn on the completion of a second six month exposure at the Desert Site. It still shows little change in appearance, apart from slight fading and some warping. The weight loss during the second exposure period was greater than that during the first, probably owing to the drier conditions prevailing. The sample gained weight during both its exposure periods at the Jungle Site. It has now been sent to the Plastics Panel, for comment.

6. TEXTILES AND CORDAGE.

6.1 Rot-Proofing with Mineral Oxides. (TTE/MOS.8/J.16). Of the four samples exposed at Jungle Site, B (1% copper), C (1% iron and 1% chromium) and E (2% iron and 2% chromium and 1% copper) are still in fairly good condition but G (mineral khaki dye) shows heavy fungal attack and is very weak. All samples are scheduled to remain on exposure until February 1956.

A second interim report (T.T.E. Report 393) was issued during the quarter.

6.2 Cotton Canvas. (TTE/MOS.8/J.20). The samples for this trial, which have been fire-water-and rot-proofed by various manufacturers, together with the controls were exposed at LAGOS, KANO and Jungle Site during February and March. The first withdrawal is due after three months' exposure. This trial forms an extension of the trial TTE/MOS.8/J.14.

6.3 Commonwealth Project. A withdrawal of samples after one year's exposure at KANO was made at the beginning of the quarter. The fabrics, although weaker than similar samples at Jungle Site, were in fairly good condition. A storm had torn some of the cordage samples off the exposure stands and these were subsequently damaged by termites. The remaining samples and also the samples of webbing were fairly strong and in good condition. There has been little change during the quarter in the condition of the production cordage samples which still remain on exposure at KANO and Jungle Site.

An interim report, giving the results up to one year's exposure, has been prepared and will be issued shortly.

6.4 Rot-Proofing of Calico. (TTE/MOS.8/J.18). Only one sample of each of the fourteen samples remains at the Jungle Site, the third withdrawal having been made in February after fourteen months' exposure. There has been little change in the condition of these samples during the quarter.

A new trial (TTE/MOS.8/J.22), which involves exposures at LAGOS and KANO, will be started as soon as all the samples arrive.

6.5 Actinic Degradation of Cotton and Wool Fibres. The fibres for the new trial to determine the regions of the solar spectrum responsible for degradation of cotton and wool, have not yet arrived but arrangements for the exposures are in hand and it is hoped to start the experiment in the near future.

6.6 Degradation of Wool. Pieces of wool cloth impregnated with manganese dioxide, together with controls, have been exposed at LAGOS for twelve weeks and at KANO for six weeks. On withdrawal their breaking strengths were determined. Although in both cases the treated sample was stronger than the untreated the differences were only of the order of 5% and therefore of little practical value.

6.7 Ropes. (TTE/MOS.8/J.15). During the quarter fungal growth has increased on the aerially exposed ropes at PORT HARCOURT, due to the damper conditions prevailing. However, apart from some of the Italian hemp controls, these ropes

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still remain after twelve months in sound condition. Deterioration has continued during the quarter on those ropes exposed on the ground at PORT HARCOURT and the general condition is poor. There has been little change in the ropes at KANO which are still in good condition.

6.8 Proofed Fabric for De-infestation. (TTE/MOS.7/H.11). These samples were put on exposure early in the quarter and the first withdrawal (after one month) has been made and the testing completed. In general, most types have shown slight deterioration, but no regular pattern has yet evolved.

7. ENGINEERING.

7.1 Motor Transport. During the quarter some 33,000 miles were covered by 19 vehicles, nearly 25,000 of which was accounted for by the four Austin A70 Utilities and the four Ford Pilots. A total of 361 vehicle/days has been spent in workshops, compared with 489 and 445 for the two previous quarters. One 3 ton Bedford was completely overhauled during the quarter and returned to service.

Data for the quarter for each group of vehicles is given in the following table :-

		<u>Days on</u> <u>Tour.</u>	<u>M.P.G.</u>	<u>Service</u>	<u>Days in</u> <u>Workshop.</u>
4 Austin A70	14,493	36	18 to 20	Local running and Tours.	86
4 Ford Pilots	10,343	45	12 to 14		80
2 Fordson Lorries (3 ton)	957	8	6 to 8		16
2 Bedford Lorries (30 cwt)	302	-	7 to 8		3
3 Bedford Lorries (3 ton)	3,342	35	7 to 8		117
1 Austin A70 Saloon	1,055	2	13	Local running and 200 mile radius tours.	9
2 Vauxhall Velox	1,628	-	12 to 16	Local running	46
1 Ford Utility	1,133	-	9		4
<u>Total</u>	<u>33,253</u>	<u>126</u>			<u>361</u>

7.2 Standard Storage Boxes. (TTE/MOS.9/K.7). The samples arrived during the quarter and twenty of the twenty-eight boxes have been exposed as follows :- (a) Jungle Site; four buried in the undergrowth; four (in transit cases) exposed in a hut, (b) LAGOS; four exposed on the beach near the Surf and four (in their transit cases) placed in the Radar Building, and (c) Base Depot; four in transit cases.

The remaining eight samples will be exposed at KANO in the next few weeks.

7.3 Tests of Adhesives for Metals. (TTE/MOS.9/K.12). The samples for this trial have been on exposure for 18 months and there has been no marked change in the condition of either the metals or the adhesives. A report covering the first year's exposure has been issued in which it is mentioned that the presence of a cellulosic film remaining from the processing of the samples has made a true assessment of the actual adhesives very difficult. A further 120 samples representing two further adhesives have been placed on exposure in connection with this trial.

7.4 Gyro Gunsights. (TTE/MOS.2/B.2). A report covering the first six months' exposure has been issued. As requested by the sponsors one tropicalised and one standard package have been withdrawn after twelve months' exposure and returned to U.K. for examination. There is little change in the condition of the packages and no report will be issued for this period.

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7.5 Bridge Decking Materials. (TTE/MOS.14/Q.1). The report covering three years' exposure has been issued. Little change in the condition of the sample has occurred.

7.7 Air Cleaners. (TTE/MOS.14/Q.2). A report covering fifteen months' exposure is ready for issue. There has been a further increase in rusting and corrosion of metal components particularly at Marine Site and in particular, assembled gaskets have had to be withdrawn. All compo-flex tubing shows deterioration, the worst being at Jungle Site.

7.8 Inflatable Life Rafts. (TTE/MOS.14/Q.4). The samples have arrived and will be exposed as soon as the racks have been constructed.

8. ELECTRONICS.

8.0 General. With the increase in trials on Plastics, much effort will be devoted to the routine electrical measurements required. The position has been aggravated by the departure of one experimental officer the replacement for which has not yet been effected.

Further work on the determination of ultra-violet radiation is held up pending receipt of new type P.E. cells and repairs to a defective recorder. The draft report on the collective results of the work so far accomplished is nearing completion and should be ready for circulation next quarter.

Of new trials proposed one is designed to check the stability and operating characteristics of transistors in natural tropical conditions.

Radio-telephone communication with OBANAKORO has been maintained without breakdown during the quarter.

8.1 Radio Components Trial. (TTE/MOS.17/T.11). After four months' exposure the following trends are evident. Wire-wound resistors show slight increase in ohmic values, carbon resistors have also increased, more so with the non-insulated types. All capacitors, with the exception of the non-standard types remained stable; the latter (Hi-K ceramic in D.2 material) show considerable variations. Of six heavy duty relays stored in the jungle three failed the voltage proof test. The tantalum condensers remain consistent in capacity, power factor and leakage rate. No mechanical deterioration has been observed. The first interim report will be due after 12 months (December 1955).

8.2 Reinforced Plastics. (Electrical Properties). (TTE/MOS.6/G.21). After three months the following grades remained stable at 1 mc. and 100 mc/s: glass silicone laminate, Bakelite 17449, Bakelite E.5089/1, acetylated cotton fabric, silicone rubbers S.50 and E.360, Epikote 828 and polyester glass laminate. Melamine glass laminate remained constant at 1 mc. but was unmeasurable at 100 mc/s. The material which showed the worst characteristics was Epikote 828 loaded with mica and another sample with a proprietary extender; both grades were unmeasurable at 1 mc. but measurable at 100 mc/s.

8.3 Field Cable D.10 (Coloured). (TTE/MOS.17/T.10). The cables have been on exposure for four months and all fifteen grades satisfactorily pass the bend test. Of the colours, white shows slight darkening to a grey colour, pink has darkened slightly on one grade and is turning a grey colour on another, the brown has darkened somewhat on two grades but a further grade (C.S. 259) shows no change; red has also remained consistent. The colour which shows greatest deterioration is the light green (C.S. 270) which is no longer discernible as such having turned almost black.

8.4 Radio Components - Stability of Carbon Resistors. In areas of high temperatures coupled with consistently high humidities these stores tend to become erratic in their behaviour. During the past two or three years some work has been done with standard carbon resistors, both packaged and openly exposed, and some encased in a cold-setting polyester resin, with others in a desiccated atmosphere subjected to normal diurnal temperature variations and also resistors in operational service. The results are being evaluated and it is hoped to prepare a report during the next quarter.

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8.9 Field Cable D.10. (TTE/MOS.17/T.9). The report on this trial has been prepared and will be ready for circulation to the sponsors within the next month.

9. BIOLOGY.

9.0 General. Work on timber, paint and textile trials is described in Sections 3, 4 and 6. Marine fouling and shipworm investigations have continued but damage to the rafts at PORT HARCOURT, OPOBO and CALABAR has caused temporary hold-ups. Attention has been given to the design and standardisation of graveyard anti-termite tests for wood preservatives; the improved methods should give more precise information on the value of preservatives against the termite species encountered under field conditions. Progress is being made on the development of a laboratory dry-wood termite test using Cryptotermes havilandi. It is hoped also to develop a rapid laboratory subterranean termite test for preservatives and materials.

9.1 Fungal Etching of Glass. After eight months there has still been no etching of the glass in the experiment described in the Progress Report for July - September 1954.

9.2 Mycology. The work on fungi associated with the deterioration of paints and ropes continues. A survey of the extent and types of fungal damage to paints in Nigeria is in hand.

Extensive damage to window frames of the residential quarters has been caused by a timber-rotting fungus. This is being examined and it is hoped to identify the species.

9.3 Inhibition of Fungal and Algal Growth. The test roofs treated some two years ago with 1% sodium pentachlorophenate, 1% sodium salicylanilide, 5% phenol and 1% pentachlorophenol solutions, and the one painted with "Snowcem" are now almost indistinguishable in colour from the untreated roof. On the other hand the sections treated with 1% copper sulphate and that treated with "Snowcem" cement paint made up with 1% copper sulphate solution shows less algal growth than the untreated roof, the "Snowcem" treatment with copper sulphate being more effective than copper sulphate alone.

In another trial, a cleaned roof treated with 1% copper sulphate solution now shows considerable black, patchy algal growth after three years but another similarly treated shows little growth after two and a half years.

Attempts to remove algal growth from affected roofs by brushing or spraying with solutions of copper sulphate without preliminary cleaning, have so far not been successful. Some of the roofs have become lighter in colour but one has become darker. It appears that even if this treatment were effective in eventually killing the algae, it is unlikely to give quick results in removing the unsightly black appearance of the roofs.

All other test roofs have only shown a slight darkening during the quarter.

9.5 Marine Fouling. (TTE/MOS.14/Q.3). The trials at PORT HARCOURT and LAGOS to investigate seasonal variation in marine fouling have been continued and a further batch of samples has been returned to U.K. for examination.

9.6 Damage due to Termites and other Insects. The survey of insects damage to woodwork in residential quarters has continued; further extensive damage to furniture, beams, door posts and window frames by dry-wood termites has been noted. Recent emergence of winged forms from certain of the buildings indicates extensive dry-wood termite activity in the wooden rafters at the residential site.

9.7 Insecticides - Dieldrin. (TTE/MOS.5/T.9). The two drums of Dieldrin 50% wettable powder for this trial arrived during March and were put on storage at Base Depot, PORT HARCOURT, immediately. For the first five months samples will be taken monthly and returned to the sponsors for examination.

9.8 Marine Borers. Assessment of shipworm attack of timber at LAGOS, OPOBO and CALABAR continues but the programme of exposures at PORT HARCOURT is held up pending completion of a new raft. Much data has now been accumulated and it is hoped to complete the analysis and produce a report during the coming quarter.



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9.9 Pesticides and Preservatives.

.91 Protim 46. (TTE/MOS.5/F.8). This trial is designed to assess the protection afforded to timber against termites by treatment with Protim 46. The material arrived during the quarter, and treatment of the samples is being carried out so as to start the tests early in the next quarter.

.92 Pestcure. (TTE/MOS.5/F.10). The material for this trial arrived during the quarter. Treatment of the samples will be carried out as soon as possible and it is hoped to start the tests during next quarter.

- .93 S.D.C. Wood Preservatives. (TTE/MOS.5/F.11). The object of this trial is to obtain information on the protection against termites afforded by treatment with various commercial preservatives. Wood samples are being treated in U.K. and they have not yet been received. Arrangements for their exposure are in hand and the tests will start as soon as the samples arrive.

10. METEOROLOGY.

10.0 General. The preparation and publication of meteorological data for reports continues.

10.1 U.V. Radiation. Recordings at LAGOS cannot be started again until a 0 - 1 mA recorder and a new photo-electric cell are obtained. Further work in the "far" U.V. band will be undertaken when the special cell, at present being calibrated by the N.M.L. is received. The report on the collated results of work carried out during the past four years is nearing completion and will be available for circulation towards the end of next quarter.

10.2 Environmental Warmth. The report on more recent data is still delayed owing to pressure of other work, but it is hoped to have some of the findings published in the near future.

10.3 Microclimatology. The preliminary work previously reported continues. It is hoped that analysis of results so far obtained will give some indication of the effectiveness of the methods being used.

10.4 Solar Radiation. Analyses of data continue. A report will be prepared as time permits.

10.5 Measurement of Dew. This work has been held in abeyance over the last six months but it is hoped to take it up again shortly.

10.7 Moisture Intake of Plants. The Evapotranspirometer has been modified to cope with increased water percolation. The collection of data continues.

10.8 Airborne Dust Particles.

.81 Survey of Atmospheric Particles. Further samples have been collected and the data will be analysed as opportunity permits.

.82 Atmospheric Dust Recorder. The construction of a portable photo-electric dust recorder is still help up by the present non-availability of a suitable photo-cell. However, progress has been made in the design of ancillary equipment and a stabilized high voltage supply and D.C. amplifier of small dimensions working from a car battery or A.C. mains, has been constructed. The output from the amplifier is sufficient to drive a ten milliamp pen recorder.

10.9 Meteorological Instruments.

.91 Wind Director Recorder. With the arrival of a number of four digit Veeder counters, the design of a new type wind direction recorder is under way. This will make it possible to obtain ready integrated counts of wind speeds and prevailing winds.

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11. MISCELLANEOUS.

11.1 Packaging, Methods 1 and 1A.

.12 (TTE/MOS.9/K.11). No withdrawals have been made from either of  
.13 (TTE/MOS.9/K.15). these trials during the quarter. An inspection showed no visible changes in the condition of the packages. The first trial has now been in Base Depot Storage for over two years and the second for fifteen months.

11.2 Preservation of Ball Bearings. (TTE/MOS.9/L.2). The first withdrawal of these samples after six months' exposure was made at the beginning of the quarter. The packages showed very little change from that reported previously, except that the grease migration had increased very slightly.

11.3 Linseed Oil Wall Covering. (TTE/MOS.5/F.3). The samples of this trial have been withdrawn at the request of the sponsors, and a report is in course of preparation. Serious stripping of the material had occurred, especially at the Jungle Site, although the surface of the material was not in very bad condition. The samples are under biological examination.

11.4 Temporary Protectives. (TTE/MOS.10/L.1). This trial has been concluded and a report is in preparation.

11.5 Masticated Rubber. (TTE/MOS.7/H.8). These samples have been withdrawn after over two years' storage at PORT HARCOURT, and a final viscosity determination made. This showed little change from the previous results. With the hot masticated control there was no change in viscosity throughout the trial nor with the sample containing thiophenol. The cold masticated control and the samples with benzoquinone and with hydrazobenzene showed a slight drop in viscosity whilst that with dibenzthiazole disulphide gave a slight rise. The rubber with 2:4 dinitrophenol and that with mercaptobenzothiazole remained steady over the first twelve months' storage and this was followed by a sharp drop in viscosity. A report will be issued shortly.

11.6 Vapour Phase Inhibitors. (TTE/MOS.9/K.16). A withdrawal was made during the quarter. There was no visible change in the condition of the packages.

11.7 Protection of Materials.

.71 Wardrobe Trial. This trial to determine the minimum heating required for a closed wardrobe with restricted internal ventilation, such as occurs when it is moderately stocked, has continued. A 40 watt bulb placed at the bottom maintains the air around the lower shelves sufficiently dry to inhibit mould but not that around the upper shelves. This points to the desirability of having supplementary heating in the upper parts of a wardrobe with stocked shelves.

.72 Library Books. It has been found necessary to use bulbs of lower wattage in the book cupboards in order to avoid overheating of the books. Installation of 40 watt bulbs below the bottom shelves and of 25 watt bulbs in the middle shelves maintains the relative humidity throughout at below 70% without overheating of the books.

11.8 Building Materials.

.81 Wallboards/Insulation Boards. At KANO further termite attack of the insulation boards has occurred. Ankarboard Porous Insulation Board Termite Proofed has been slightly attacked and Fibrex Porous Insulation Board completely devoured by termites. There has been little change in condition of the hardboards. At PORT HARCOURT, Oil Treated Fibrex Termite Proofed Hardboard and Standard Ankarboard Porous Insulation Board have suffered slight termite damage but otherwise there has been little change. There has also been little change in condition of the samples on exposure at Jungle Site.

A report on this trial is being prepared.

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.82 Heat Insulating Materials. The samples on exposure at KANO and PORT HARCOURT have undergone further termite damage. The samples buried at Jungle Site have not been attacked by termites but have undergone delamination and rotting. A final report on the trial will be prepared shortly.

.83 Paramount Plasterboard. The two samples exposed at the beginning of the quarter are due for inspection in April.

11.9 Treated Book-Bindings. (TTE/MOS.10/K.17). After nine months the books stored in their crate at PORT HARCOURT Town have shown an increase in fungal growth, especially inside the covers. Termite attack on the crated books at KANO has extended slightly and there is still considerable fungal growth on the samples at the bottom of the crate. Most of the samples on open shelves at PORT HARCOURT show slight superficial fungal growth, mainly confined to the spines. Those on open shelves at KANO remain in good condition. A first interim report has been prepared and will be issued shortly.

11.10 Chemicals and Apparatus. (TTE/MOS.5/F.7). These stores arrived early in the quarter in very good condition although the majority of the individual sealed packages had punctured. Inspections to date show little or no deterioration with the exception of two similar items which were subjected to drastic conditions resulting in the removal of protective metal plating.

## 12. SITES AND BUILDINGS.

### 12.1 Buildings.

.21 Minor Works. Work continues on redecorating flats on the Residential site. It is hoped to make a start shortly on repainting the exteriors. Continual work is necessary to maintain the palm-thatch roofs of the workshops, laboratories and other buildings. During recent storms the roofs suffered appreciable damage and large sections were torn off; some dislocation of work resulted.

## 13. ADMINISTRATIVE.

13.1 Motor Transport. The present vehicles continue to operate satisfactorily though the Ford Pilots give much more trouble than the Austin A70 Hereford Utilities. One Ford Pilot was badly damaged whilst returning from KANO in February; the vehicle hit a tree after a tyre-burst. Fortunately there were no serious injuries to personnel but the vehicle is damaged beyond economical repair.

13.2 Tours. 121 man-days have been spent on tour during the quarter of which 40 were at LAGOS and 57 at KANO.

13.3 Visits. During the quarter the establishment was visited by the Director of Materials and Explosives Research, Dr. C.H. Johnson who spent 10 days at PORT HARCOURT and was accompanied by Mr. R.A. Thomson Assistant Secretary M.S.6, Ministry of Supply. Other distinguished visitors during the quarter were :-

Rt. Hon. A.T. Lennox-Boyd	-	Colonial Secretary, London.
G. Nwokodi, Esq.	-	Ministry of Labour, Enugu.
J.G. Swindlehurst, Esq.	-	U.A.C., London.
Captain W.J. Coombs, R.N.R.	-	Merchant Navy Federation.
W. Victor Harris, Esq.	-	Colonial Termite Research Unit, London.
W.L. Cox, Esq.	-	Federal Ministry of Lands, Nigeria.
Dr. D.N. Robertson	-	U.A.C., London.
A.S.G. Hill, Esq.	-	C.D.E.E. Porton.

### 13.4 Staff.

.41 European Staff. The U.K. based staff numbered 26 at the end of March 1955, including four on U.K. leave and one on detached duty at the M.O.S. Station, OHANAKORO. During the quarter one H.E.O. and one

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Eng. (Tech) III returned to the U.K. on termination of service after completing their first tour, and one Senior Photographer after completing his second tour. Replacements for these three officers have already arrived.

A list of staff as at 31.3.55 is shown at the end of this section. A total of 20 days were lost through sickness involving eight officers.

.42 African Staff. In March approval was given for the introduction of non-industrial gradings for certain locally recruited employees. The thirty-four staff concerned have been assimilated to improved pay scales, and enjoy better conditions of service generally, as from 1st September, 1954.

Relations with the staff continue to be satisfactory.

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Officers on strength at 31.3.55.

Dr. B.J. McNulty	S.P.S.O.
Mr. A.A.J. Bain	P.S.O.
Mr. D. Butterworth	S.S.O.
Mr. N.B. Griffin	S. Exp. O.
Mr. D.G. Coursey	S.O.
Mr. S. Scrogg	Exp. O. (On leave in U.K.)
Mr. E.L.S. Lawes	Snr. Photographer
Mr. D.W. Gough	Eng. (Tech) III.
Mr. P.C. Wilkins	A. Exp. O.
Mr. D. Kay	" (On leave in U.K.)
Mr. R.A. Secker	"
Mr. R.J.A. Goodyear	"
Mr. D.M. Gascoyne	"
Mr. R.B. Hey	"
Mr. E.W. Last	S.E.O.
Mr. B.W. Jerrom	H.E.O.
Mr. H.J. Winmill	E.O.
Mr. J. Scott	Eng. (Tech) II.
Mr. H. Airlie	" " III.
Mr. D.B. Stephen	" " (On leave in U.K.)
Mr. S.J. Marshall	C.O. (On detached duty at M.O.S. Station, OBANAKORO).
Mr. C.S.H. Ashcroft	C.O.
Mr. J. Bird	" (On leave in U.K.)
Miss C.M. Vines	C.O./Sec.
Miss M.J. Rhead	C.O.
Mr. E.J. Glozier	C.O.

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QUARTERLY PROGRESS REPORT

January - March, 1955.

14. ITEMS UNDER SECURITY CLASSIFICATION

- 14.1 Obanakoro Scheme. The seasons trials were concluded in March and the team have returned to U.K. The officer loaned for administrative duties will return to Port Harcourt as soon as closing down of the station has been completed.
- 14.2 Aircraft Bombs and Clusters. (O.B. Proc.Q.6509.). The report referred to in the last Quarterly Progress Report has been prepared and will be issued shortly.
- 14.3 Gun Ammunition (T.T.E./M.O.S.3/C.4). Inspections covering three years' exposure have now been made at all sites, and a report based on these inspections has been made. There is comparatively little change from the previous report.
- 14.4 Gun Barrels (T.T.E./M.O.S.9/K.4). These barrels have been exposed at the Marine Site, Lagos, for nearly one year. Five of the barrels, one of each of the internal protective treatments, were opened after 10 months' exposure and the interior examined with a bore examining mirror. All were free from internal defects. The barrels were then re-protected and the tampions replaced. A report on this trial has been prepared, and will be issued shortly.
- 14.5 Mines A.T. Mk.7. (T.T.E./M.O.S.3/C.5). This trial has now been concluded and a final report covering the whole trial has been prepared. Throughout the trial, moulded rubber coverings have shown the least deterioration, and latex coverings the most. Deterioration was more extensive on the items on open exposure than on the buried items.
- 14.6 Q.F. 20 Pdr. A.P.D.S./T. (T.T.E./M.O.S.3/C.7). An inspection of the items on exposure at the Jungle Site, after two years' exposure, has been made. There has been comparatively little change since the previous report. Arrangements are in hand to withdraw the remaining twenty rounds on open exposure at the Desert Site early next quarter.
- 14.7 Mines and Components. The samples have now been on exposure for three to four months. Comparatively little deterioration has occurred except in the case of the Mines, Anti-Personnel, which showed much rusting and corrosion of the pins. Reports on these trials will be due next quarter.

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Information Centre  
Knowledge Services  
**[dstl]** Porton Down,  
Salisbury  
Wiltshire  
SP1 0JQ  
22060-6218  
Tel. 01980-611753  
Fax 01980-612970

Defense Technical Information Center (DTIC)  
8725 John J. Kingman Road, Suit 0944  
Fort Belvoir, VA 22060-6218  
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Record Summary: AVIA 45/125

Title: Tropical Testing Establishment, Nigeria: quarterly progress report, Jan-Mar 1955  
Availability Open Document, Open Description, Normal Closure before FOI Act: 30 years  
Former reference (Department) TTE/PR/29  
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